circumstances where the fading of the radio signal does not change in the course of time, because the quantities calculated from the received packets are no more valid, if the time between the packets is that long that the fading effects have time to change significantly. So, the method proposed by the publication is intended for wireless local networks, where the application area is in general an office surrounding and the terminal devices are during the use almost stationary with respect to the base stations.

An object of the present invention is to provide a method by means of which a device with a wireless packet switched link is able to control its transmission power taking into consideration the special needs of the packet switched link.

The object of the present invention is achieved by merging the features of open-loop and closed-loop control, whereby the feedback information required by the closed-loop is attached to the acknowledgment packet expressing that a certain packet is successfully received, and the open-loop control is used, when this kind of acknowledgment packets are not available.

SUMMARY OF THE INVENTION

The method in accordance with the present invention is characterized in that in the first state of the transmitting device, the transmission power has a certain default value, and in the second state of the transmitting device the transmission power control is based as well on the feedback information on the quality of the data transfer link given by the acknowledgment messages of the receiving device, as on a certain default value. For the part of the terminal device, the default value is based on the measurement of the signals transmitted regularly by the base station and for the part of the base station, the default value is based on the maximum power and the time passed from the previous acknowledgment message.

In the method in accordance with the invention, a radio device transmitting only periodically evaluates, before starting the transmission and between the transmissions, what is the minimum power required for the transmission. The power determined by the evaluation is called the transmission power default value. The evaluation can be based on characteristics of the radio transmission in the reverse direction or on an assumption formed some other way about the way that the propagation conditions of the radio waves will be changed. After the transmitting device has sent a certain data packet, it receives according to the data transfer protocol being used, an acknowledgment from the receiving device, with information attached thereto by the receiving device how successful the transmission has been. The transmitting device calculates the correction of the transmission power based on the feedback included in said acknowledgment. At the same time, however, it continually evaluates also the need for transmission power, without any feedback from the receiving device. The value of the transmission power is determined by the feedback, the default value of the transmission power and the time passed from the reception of the feedback, within the limits set by certain boundary values. Thus, the method in accordance with the invention has features related with both the closed and the open-loop control.

In a cellular system the application of the invention depends on, whether the base station is concerned or the terminal device. Namely, in the known solutions the base station transmits continuously or at least very regularly certain control messages, whereby the terminal device can follow, based on the control messages received by it, the changing of the propagation conditions of the radio waves and update the default value of the transmission power maintained by it. The base station can't use exactly the same kind of a method, because the terminal devices are not transmitting continuously. The power control of the transmission in a packet form, effected occasionally in the base station, must be made numerically, e.g. so that the default value is—within certain boundary values—the bigger the longer the time is that has passed from the transmission of the previous packet.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the invention will be described in more detail with reference to the proposed preferred embodiments and enclosed drawings, wherein

FIG. **1** illustrates as a simplified state diagram the principle of the invention,

FIG. **2** illustrates known protocol stacks in the GPRS system, and

FIG. **3** illustrates as a flow diagram one preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is intended to be applied to a cellular radio system, in which there is reserved the possibility at least for the terminal device (e.g. a mobile phone) and preferably also for the base station to control the transmission power in connection with the data transfer in a packet form. The available power range is limited by certain maximum and minimum values and a principle object is to adjust the power each time to be as low as possible, in a way, however, that the quality of the link achieves a certain required standard. In this application, the GSM system is dealt with as an exemplified cellular system, the GPRS packet protocol (Global Packet Radio Service) being planned as an extension thereto. The appreviations and special terms related to the GSM and GPRS are, however, not meant to be restrictive from the point of view of the invention.

According to the proposals concerning the GPRS, the packet data channels are separated to Master and Slave channels. The MPDCH channels (Master Packet Data CHannel) include two separate logical channel types that are the PCCCH (Packet Common Control CHannel) and the PBCCH (Packet Broadcast Control CHannel). On the last of these two, the base station transmits regularly certain broadcast type control signals. In the case that there is no free MPDCH channel in a certain cell, the control messages that belong to the packet links must be transmitted along the signaling channels defined to circuit switched links. The SPDCH channels (Slave Packet Data CHannel) also include two separate channel types that are the PDTCH (Packet Data Transfer CHannel) and the PACCH (Packet Associated Control CHannel). From these two, the latter one is used for transmitting the acknowledgments associated with the received packets. The method in accordance with the present invention requires certain measuring results expressing the quality of the received signal, to be delivered as feedback to the transmitting device. The measuring results can easily be attached to the acknowledgments transmitted on the PACCH channel.

FIG. **1** is a simplified state diagram describing the "Initial" state **10** and the "Continuous" state **11**. The first mentioned of these two means a state in accordance with the present invention, in which the feedback information on the